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Implementation Considerations for Numeric Nutrient Criteria

Goal: To better understand options for implementing numeric water quality standards.

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Topics to be Covered

1. Nutrient reduction frameworks
2. Barriers to nutrient criteria adoption
3. Economic study of nitrogen and phosphorus pollution
4. Compliance schedules
5. Variances
6. Antidegradation
7. Trading
8. Point source treatment options
9. Nonpoint source treatments options
10. Flexibilities on TMDL development and implementation

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Nutrient Reduction Frameworks

Nutrient Reduction Frameworks: Nancy Stoner 2011 Memo

- Promotes a partnership among EPA, states and collaborating stakeholders to reduce nitrogen and phosphorus loadings to our nation's waters.
  - Focuses on the environmental outcomes.
  - Recommends a set of elements for a state or tribal nutrient reduction framework.
    - Prioritize and set up nitrogen and phosphorus loading reductions for watersheds.
    - Develop watershed-scale plans that ensure effective agricultural practices and point source permits in priority areas.

Nutrient Reduction Frameworks: Nancy Stoner 2011 Memo

- Identify how state, county and local governments can use tools to ensure reductions from stormwater and septic systems.
- Set accountability and verification measures and report to the public.
- Develop a work plan and schedule for numeric criteria development.

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Barriers to Nutrient Criteria Adoption

Barriers to Nutrient Criteria Adoption

What are "barriers"? Technical and policy hurdles identified by states and conveyed to EPA that might hinder adoption of numeric nutrient criteria.

"Barriers" document:

- Product of a 2011 EPA/state workgroup, which identified several of the highest-priority barriers and options to help EPA address those hurdles.
- Outlines specific EPA actions to address these highest-priority barriers.
- Joint effort among standards, permitting and assessment/listing programs.
- Additional barriers will be addressed every two years.

Barriers to Nutrient Criteria Adoption

Title: *Actions to Help States Address Barriers to Numeric Nutrient Criteria Implementation (2012–2014)*, EPA-820-F-13-011, August 2013

Topics include: Water Quality Standards Program; Assessment, Listing, Total Maximum Daily Load (TMDL) and Nonpoint Sources Programs; and Permits, Technology and Compliance Programs.

Barriers to Nutrient Criteria Adoption

Program Areas Covered:

1. **Water Quality Standards**
   - Barrier: Difficulty using variances as a tool to achieve incremental improvements.
   - Barrier: Challenge associated with the implementation costs and with the temporal and spatial variability of the causal parameters (total nitrogen and total phosphorus).
2. **Assessment, Listing, TMDL and Nonpoint Sources**
   - Barrier: Challenges in streamlining TMDL development.
   - Barrier: Inability to reduce nonpoint source loads of nitrogen and phosphorus.

Barriers to Nutrient Criteria Adoption

3. **Permitting, Technology and Compliance**
   - Barrier: Problems implementing water quality-based limits.
   - Barrier: Lack of training and tools for permit writers.

For more information, contact Luke Cole, 202-566-9988.

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Economic Study of Nitrogen and Phosphorus Pollution

Economic Study of Nitrogen and Phosphorus Pollution (Early 2014)

- Study will provide states/tribes with the most current economic information to assist with decision making on the implementation of numeric nutrient criteria.
- Compilation of actual and occurring costs associated with:
  - Impacts of nitrogen and phosphorus pollution:
    - Harmful algal blooms (e.g., tourism, fisheries, property values)
    - Dissolved oxygen issues
    - Drinking water treatment

Economic Study of Nitrogen and Phosphorus Pollution (Early 2014)

- Controlling nitrogen and phosphorus pollution
  - Point sources
  - Nonpoint sources
  - Long-term planning (e.g., TMDL development, trading programs)
  - Short-term mitigation (e.g., alum treatment, aeration)
- Searchable database of references, reports and other publications.

For more information, contact Mario Sengco, 202-566-2676.

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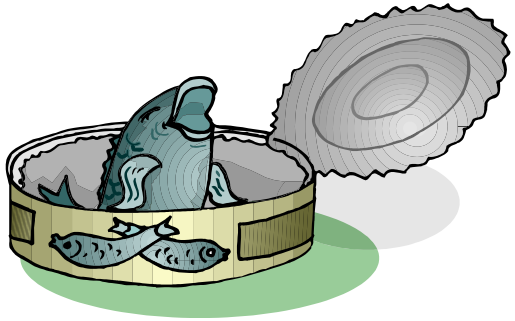
Compliance Schedules

Compliance Schedules (40 CFR 122.47)

- Permit may, when appropriate, specify a schedule of compliance leading to compliance with CWA and regulations.
- Technology-based limitations
  - Generally not allowed because CWA compliance deadlines have passed for existing sources.
- Water quality-based limitations
  - Star-Kist decision (1990)
  - Memorandum from James A. Hanlon (2007)

Compliance Schedule Considerations

- Star-Kist Decision (April 16, 1990).
  - Require immediate compliance with effluent limitations based on WQS adopted on or before July 1, 1977.
  - May allow compliance schedules for limitations based on WQS adopted or modified after July 1, 1977, only if the state has clearly indicated in its WQS or implementing regulations that it intends to allow compliance schedules.



Compliance Schedule Considerations

- Memorandum from James A. Hanlon (May 10, 2007).
  - Demonstrate that the permittee cannot immediately comply with new limit.
  - Justify and document "appropriateness."
  - Evaluate and justify "as soon as possible."
  - Include enforceable sequence of events leading to compliance (interim milestones as needed).
  - Include enforceable "final" effluent limitation and date for achievement.
  - Not appropriate for schedule solely to provide time to develop TMDL or conduct use attainability analysis.

For more information, contact Virginia Kibler, 202-564-0596.

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Variances

Water Quality Standard (WQS) Variances

- A time-limited designated use and associated criterion that may provide the basis for an alternative water quality-based effluent limit (WQBEL).
- Applies to specific pollutants(s) and permittee(s).
- Is a change to water quality standards (WQS) that must be reviewed and approved by EPA.
- Identifies the highest attainable condition.
- The underlying designated use is the applicable WQS for all other Clean Water Act (CWA) purposes (e.g., 303(d) listing and TMDL development).

Water Quality Standard (WQS) Variances

- 40 CFR 131.13 General policies.
  "States may, at their discretion, include in their State standards, policies generally affecting their application and implementation, such as mixing zones, low flows and ***variances***. Such policies are subject to EPA review and approval."
- Variance policies/authorizing provisions are at the discretion of the state. They are not legally required for states to use WQS variances.
- A sequential series of memoranda, policy documents and legal opinions guides the use of WQS variances today.

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When Might a WQS Variance Be Appropriate?

- The designated use is not currently attainable, but it might be in the future.
- The designated use is not being attained and time is needed to study whether it is attainable, but actions can be taken to make progress toward it.
- The designated use is not attainable, but actions can be taken to make environmental progress while the highest attainable use is being determined.

Must Fulfill the Same Regulatory Requirements as Those for Removing a Designated Use (§ 131.10)

- May not remove protection for an existing use.
- Unattainable with technology-based standards.
- Unattainable with cost-effective and reasonable BMPs and nonpoint source controls.

Must Fulfill the Same Regulatory Requirements as Those for Removing a Designated Use (§ 131.10)

- Unattainable due to at least one of the following reasons:
  1. Naturally occurring pollutant concentrations.
  2. Natural, ephemeral, intermittent or low-flow conditions.
  3. Human-caused conditions cannot be remedied or would cause more environmental damage to correct than to leave in place.
  4. Dams, diversions or other hydrologic modifications.
  5. Physical conditions related to natural features preclude aquatic life uses.
  6. Controls more stringent than needed to meet technology-based limits cause substantial and widespread economic and social impact.

WQS Variances Are Different from Permit Compliance Schedules

Compliance schedules	WQS variances
Actions and time needed to comply with the WQBEL are known (and are in the permit). The permit is complying with WQS "as soon as possible." A condition of the permit.	Actions and time needed to comply with the WQBEL are uncertain. The WQS is temporarily modified and WQBELs are adjusted such that incremental progress can be made toward attaining the standard. A change to WQS.

Bottom Line

A WQS variance **is not**:

A way to give a less stringent National Pollutant Discharge Elimination System (NPDES) permit limit because the discharger believes compliance with a new WQBEL will be costly or unfair, or the current limit is already stringent enough.

A WQS variance is:

A time-limited designated use and criteria when the underlying use is not immediately attain-able; it provides the legal basis for less stringent requirements in an NPDES permit while steps are taken toward attaining the designated use.

For more information, contact Gary Russo (russo.gary@epa.gov, (202) 566-1335) or Manjali Vlcan (vlcan.manjali@epa.gov, (202) 566-0373).

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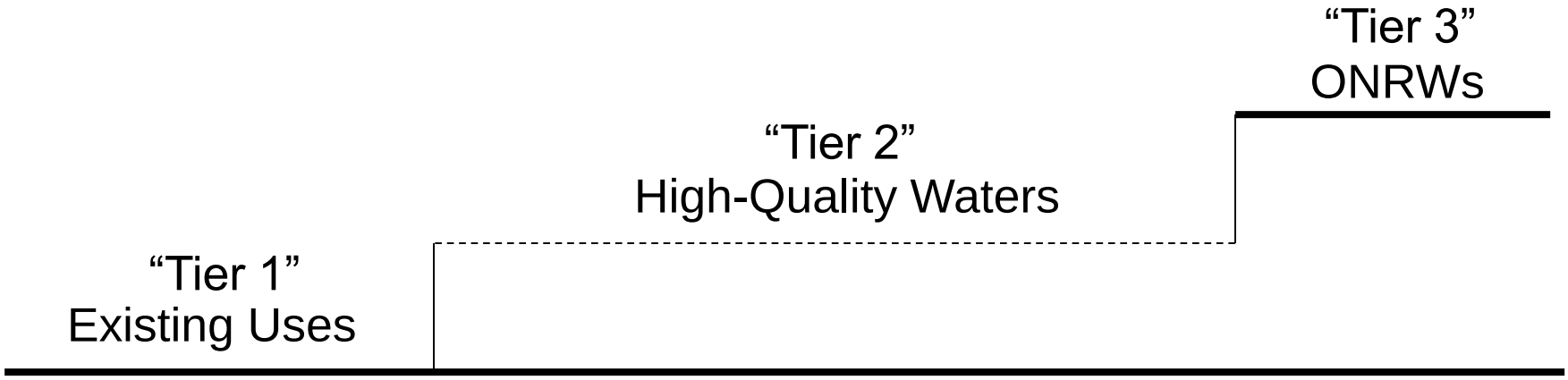
Antidegradation

Antidegradation

- Element of water quality standards, like criteria and uses.
- Mechanism used by states and tribes to protect existing uses, high-quality waters and Outstanding National Resource Waters (ONRWs).
- Considered in the context of authorizing an activity that might impact water quality (not when developing criteria).

  For example, in developing an NPDES permit, a permit writer would develop limits and conditions based on the relevant criteria and antidegradation considerations.

The 3 "Tiers" of Antidegradation Protection (40 CFR 131.12)



- **Tier 1 (Existing Uses):** Baseline of protection for all waters of the United States.
- **Tier 2 (High-Quality Waters):** For waterbodies where water quality exceeds CWA 101(a) goals and where quality must be maintained and protected.

The 3 "Tiers" of Antidegradation Protection (40 CFR 131.12)

- **Tier 2 (High-Quality Waters), continued:**
  - High water quality may be lowered only if state/tribe finds lowering to be "*necessary* to accommodate *important* economic or social development."
  - Tier 2 antidegradation review is the process through which a state/tribe makes an informed choice about a proposed activity that would lower water quality.
- **Tier 3 (Outstanding National Resource Waters):** Most stringent level of protection.
  - *No* degradation is allowed in ONRWs, except on a short-term or temporary basis if allowed by the state's or tribe's policy and procedures.
  - State or tribe identifies its own ONRWs, which can be *any* waterbodies (e.g., National Parks).

Antidegradation vs. Antibacksliding

Antidegradation	Antibacksliding
A component of WQS. A framework for protecting existing uses, high-quality waters and ONRWs. Analysis is triggered in the context of an activity that would affect water quality (e.g., an NPDES permit application).	Not a component of WQS but of permitting. A general prohibition on reissuing or renewing a permit with less stringent effluent limitations than those in the previous permit (with some exceptions).

For more information, contact Heather Goss, 202-566-1198.

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Water Quality Trading

Water Quality Trading

- Water quality trading is a voluntary exchange of pollutant reduction credits.
- A credit is a unit of pollutant reduction needed by a buyer, usually measured in pounds equivalent.
  - Generated by a point source over-controlling its discharge.
  - Generated by a nonpoint source from the installation of best management practices beyond those required for meeting its baseline.
- Sources with higher pollutant control costs may purchase pollutant credits from sources with lower control costs.

What Pollutants May Be Traded

- National Policy allows trades for:
  - Total nitrogen
  - Total phosphorus
  - Sediment
  - Cross-pollutant trading
  - Other pollutants?
- National Policy does not allow trades for:
  - persistent bioaccumulative toxics (PBTs).

Types of Trades

- Point source–point source
- Multiple-facility point source
- Credit exchange
- Nonpoint source–point source
- Nonpoint source credit exchange

To Trade or Not to Trade

- Where may trading occur?
  - Impaired waters
    - TMDL: Meet wasteload allocation (WLA) and load allocation (LA).
    - Pre-TMDL: Improve water quality.
  - Unimpaired waters to maintain WQS
- Where may trading *not* occur?
  - May not be used to meet technology-based effluent limits.
  - May not cause nonattainment of an applicable WQS.
  - May not adversely affect water quality at an intake for drinking water supply.
  - May not cause a cap established under a TMDL to be exceeded.

For more information, contact Amelia Letnes, letnes.amelia@epa.gov, 202-564-5627.

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Point Source Treatment Options

Nutrient Removal Technology

- Most publicly owned treatment works (POTWs) in the United States provide a minimum of secondary treatment.
- The current secondary treatment standards do not include nitrogen and phosphorus.
- Additional treatment is needed to remove phosphorus and nitrogen to any substantial extent

Advanced Nutrient Removal Technologies

- Advanced treatment technologies extend capabilities of conventional secondary (biological) treatment processes.
- Advanced technologies include:
  - Chemical processes
  - Biological nutrient removal (BNR)
  - Physical processes
- Limit of technology:
  - Nitrogen: Range from 8.0 to 3.0 mg/L
  - Phosphorus: Range from 1.0 to 0.05 mg/L

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Nonpoint Source Treatment Options

Relative Effectiveness of Nutrient Management BMPs

Chesapeake Bay example:

Percentage Change of Total Phosphorus Loads	Percentage Change of Total Nitrogen Loads
-35%	-15%

Source: Adapted from USEPA (1993), p. 2-55.

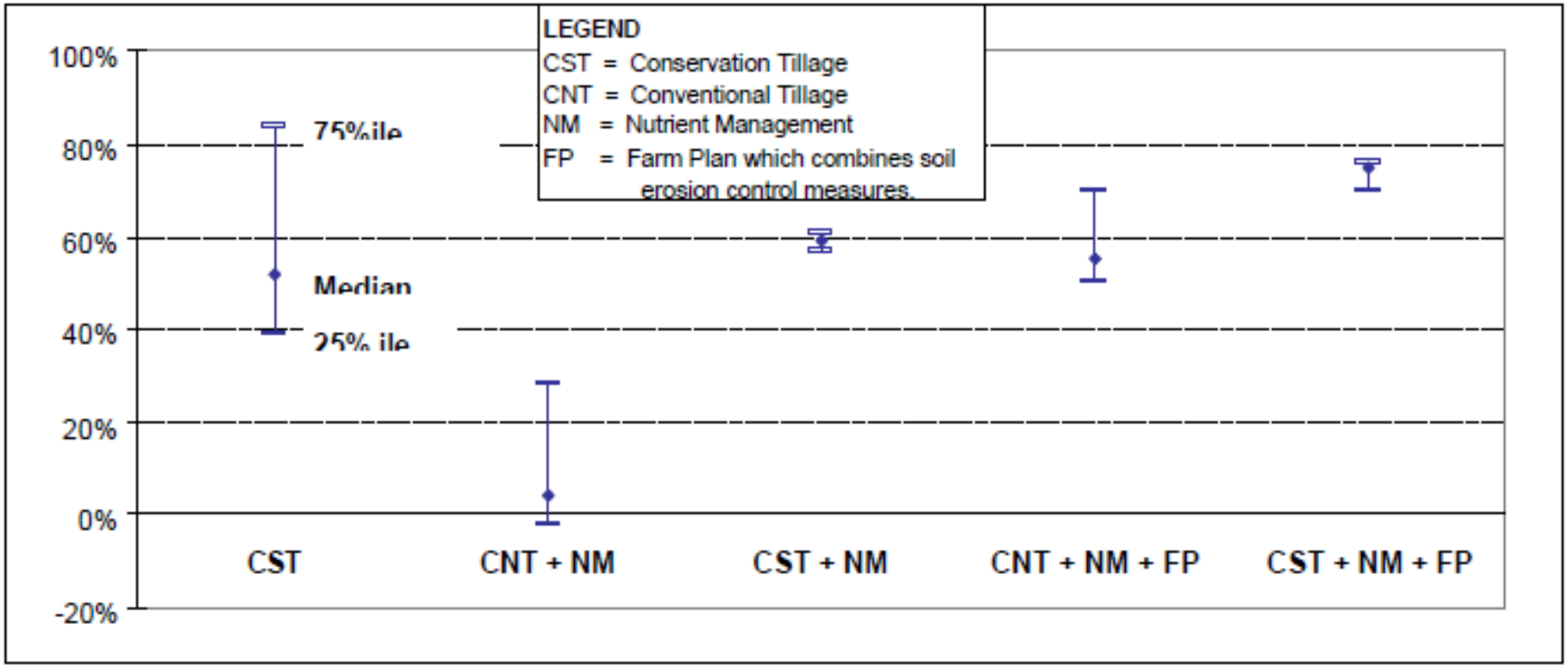
Conventional Tillage vs. Conservation Tillage

	Difference between conservation tillage and conventional tillage
Production cost	Lower by $135 per hectare
Yield	Higher by 150 kilos per hectare
Net return	Higher by $320 per hectare

Source: Cestti, R., J. Srivastava, and S. Jung. 2003. Agriculture Non-point Source Pollution Control – Good Management Practices, Chesapeake Bay Experience. The World Bank, Washington, D.C.

Nutrient Removal Efficiency of BMPs in Terms of Removal of Nitrogen from Cultivated Lands

Chesapeake Bay example



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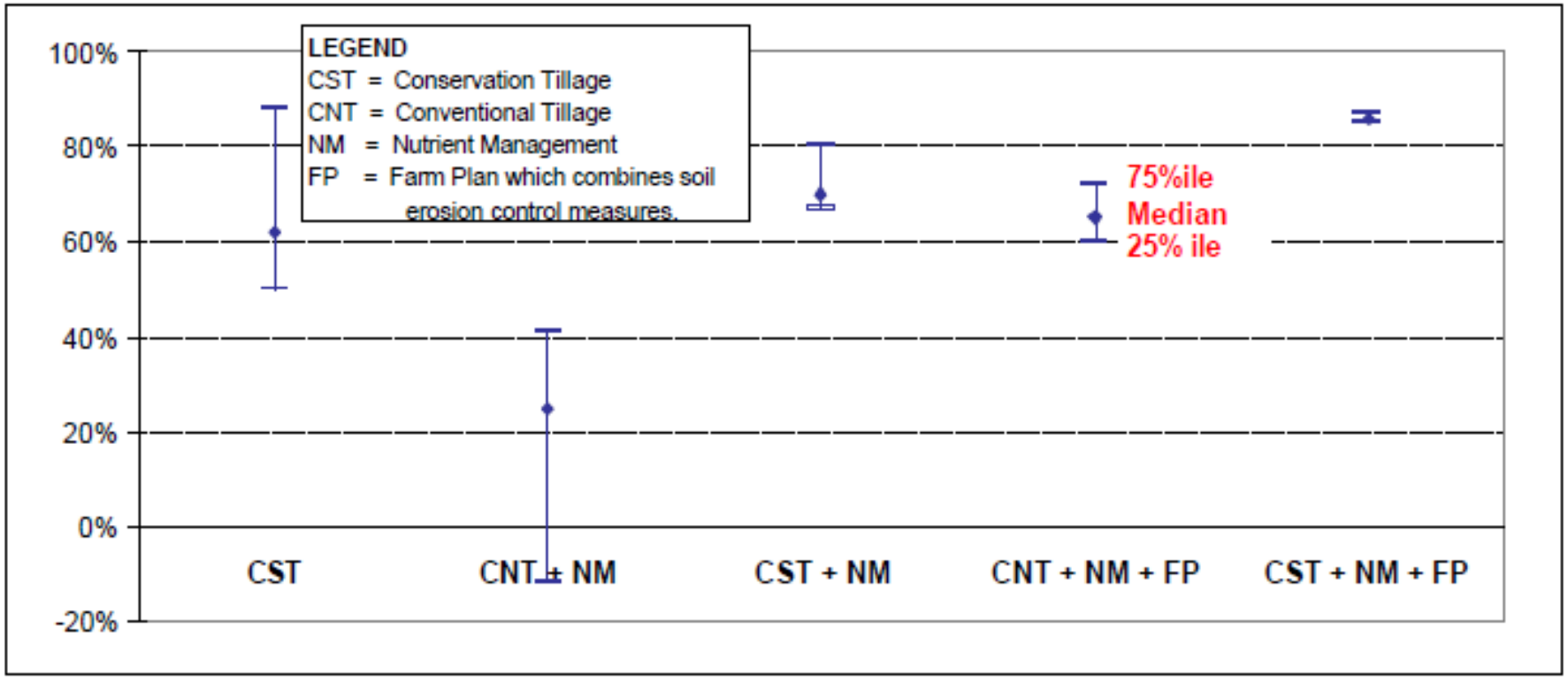
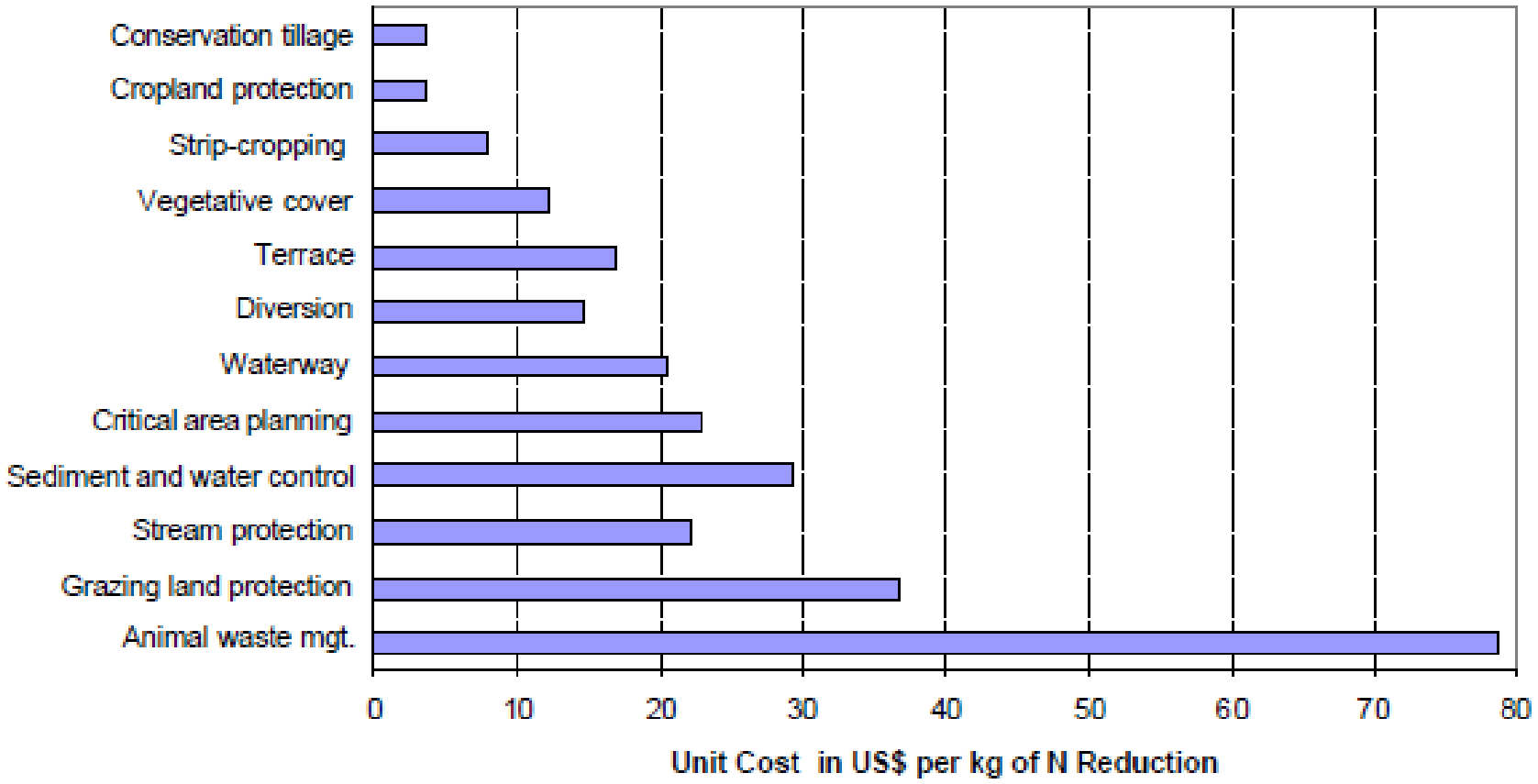


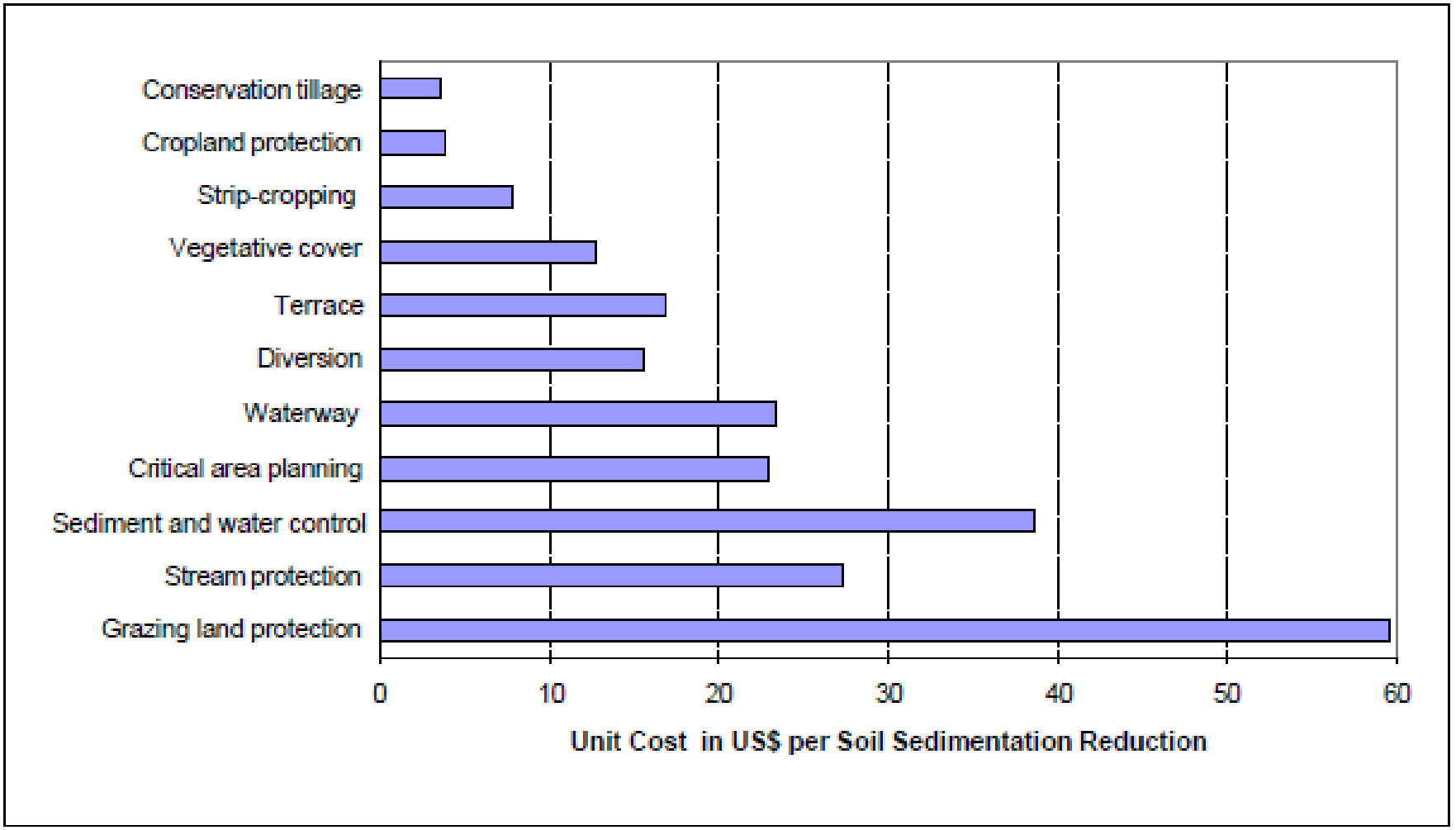
Source: Cestti, R., J. Srivastava, and S. Jung. 2003. Agriculture Non-point Source Pollution Control – Good Management Practices, Chesapeake Bay Experience. The World Bank, Washington, D.C.

Cost-effectiveness of BMPs in Reducing Nutrients



Source: Cestti, R., J. Srivastava, and S. Jung. 2003. Agriculture Non-point Source Pollution Control – Good Management Practices, Chesapeake Bay Experience. The World Bank, Washington, D.C.

Cost-effectiveness of BMPs in Reducing Sediments



Source: Cestti, R., J. Srivastava, and S. Jung. 2003. Agriculture Non-point Source Pollution Control – Good Management Practices, Chesapeake Bay Experience. The World Bank, Washington, D.C.

Stormwater BMP Cost-effectiveness Study: Example (James River Watershed)

Most cost-effective BMPs

TN	1. Pet waste programs 2. Illicit discharge elimination--sewer repair 3. Illicit discharge elimination--correction of cross connections 4. Forest buffers 5. Urban growth reduction
TP	1. Pet waste programs 2. Illicit discharge elimination--sewer repair 3. Illicit discharge elimination--correction of cross connections 4. Urban stream restoration (recommended interim efficiencies) 5. Urban growth reduction
TSS	1. Illicit discharge elimination--sewer repair 2. Urban stream restoration (recommended interim efficiencies) 3. Urban growth reduction 4. Retrofit of existing dry pond (conversion to wet pond or wetland) 5. Vegetated open channels (A/B soils, no underdrain)

Source: Center for Watershed Protection. 2013. Cost Effective Stormwater Management in the James River Watershed.

Stormwater BMP Cost-effectiveness Study: Example (James River Watershed)

Least cost-effective BMPs

TN	1. Permeable pavement (without sand, vegetated, C/D soils, underdrain) 2. Permeable pavement (with sand, vegetated, C/D soils, underdrain) 3. Hydrodynamic structures 4. Dry detention ponds 5. Permeable pavement (with sand, vegetated, A/B soils, underdrain)
TP	1. Permeable pavement (with sand, vegetated, C/D soils, underdrain) 2. Permeable pavement (without sand, vegetated, C/D soils, underdrain) 3. Hydrodynamic structures 4. Permeable pavement (with sand, vegetated, A/B soils, underdrain) 5. Dry detention ponds
TSS	1. Hydrodynamic structures 2. Permeable pavement (with sand, vegetated, C/D soils, underdrain) 3. Tree planting 4. Dry detention ponds 5. Permeable pavement (with sand, vegetated, A/B soils, underdrain)

Source: Center for Watershed Protection. 2013. Cost Effective Stormwater Management in the James River Watershed.

Stormwater BMP Cost-effectiveness Study: Example (James River Watershed)

Annual cost of removal

Pollutant	Annual Cost of Removal ($/lb)
TN	$0.41 to $14,450
TP	$3.11 to $70,340
TSS	$0.89 to $70

Source: Center for Watershed Protection. 2013. Cost Effective Stormwater Management in the James River Watershed.

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Key Flexibilities for TMDL Development and Implementation Based on Numeric Nutrient Criteria

This Presentation Covers . . .

- Basic CWA section 303(d) requirements and relevant terminology.
- Key program flexibilities:
  - Timing of TMDL development
  - Allocating loads in TMDLs
  - Implementing TMDLs
  - Revising TMDLs

Basics:
CWA 303(d) Requirements

State requirements:

- Develop a list of impaired waters (i.e., section 303(d) list) every two years.
- Establish a priority ranking for waters on the section 303(d) list and develop TMDLs for them.

  A TMDL is the maximum amount of a pollutant that a waterbody can receive and still meet applicable WQS with a margin of safety, and an allocation of that amount to the pollutant's point and nonpoint sources.

Basics:
CWA 303(d) Requirements

EPA requirements:

- Approve or disapprove the section 303(d) lists and TMDLs.
- If EPA disapproves a state's submission, then EPA must establish the section 303(d) list (i.e., add impaired waters) and/or TMDL for the state.

Basics: Water Quality Reporting Categories and Relevant Terminology

Category	Description
1	All designated uses (DUs) met
2	Some, but not all, DUs met
3	Cannot determine whether any DUs met
4	*Impaired/threatened* – TMDL not needed
4a	TMDL completed
4b	TMDL alternative
4c	Non-pollutant causes
5	*Impaired/threatened* by pollutant – TMDL needed

Section 303(d) List

Flexibility – Timing

- States have flexibility on when TMDLs are developed for impaired waters.
  - Statute and EPA regulations *do not* specify a schedule for TMDL development. Statute requires submission "from time to time."
  - Long-standing (1997) EPA guidance recommends that TMDLs be developed generally within 8 to 13 years of initial listing, but could be longer or shorter based on site-specific circumstances.
  - Statute and EPA regulations *do* require states to assign a priority ranking and schedule for TMDL development.

    EPA approves that they have a ranking and schedule, but not what the specific priority ranking is.

Flexibility – Timing

- Such flexibility provides states an opportunity to address significant uncertainties that might exist (e.g., water quality data, existing loads, hydrology) prior to establishing a TMDL.

  The need for TMDLs developed under short time frames and with significant uncertainty (i.e., “phased TMDLs”) will be less in the future given that most of the program’s TMDL development pace related to historical litigation has been met.

Flexibility – Timing

- For certain situations, such flexibility also provides states an opportunity to address impairments with near-term implementation actions that may obviate the need for a TMDL.
  - Category 4b: Other “required requirements” that will meet water quality standards.
  - Category 5: Waters on the section 303(d) list, but assigned low priority for TMDL development while near-term pollutant load reduction actions designed to meet water quality standards are implemented (e.g., “straight to implementation” projects).

Flexibility – Load Allocation

- States have flexibility on how point source (WLA) and nonpoint source (LA) loads are allocated in TMDLs.
  - Statute and EPA regulations *do not* specify how states should allocate load reductions from point and nonpoint sources.

Flexibility – Load Allocation

- EPA guidance(s) provides that states may consider a number of site-specific factors when designing TMDL load allocation approaches, including, but not limited to:
  - Location and magnitude of pollutant source(s)
  - Controllability
  - Regulatory authority
  - Feasibility and cost
  - Magnitude of impact and probability of success
  - Reasonable assurance
  - Stakeholder objectives/parity

Flexibility – Implementing TMDLs

- States have flexibility on when TMDLs need to be implemented.
  - Statute and EPA regulations *do not* specify a schedule for TMDL implementation.
  - Statute and EPA regulations *do* require that NPDES permit limits derive from and comply with WQS and be "consistent with the assumptions and requirements" of any available WLAs (such as those in TMDLs).
- Such flexibility further supports a state's opportunity to design TMDL load allocation approaches that take into account site-specific factors.
  - In some cases, states may choose to employ a "staged implementation" approach whereby WLAs to point sources are based on expected longer-term reductions from nonpoint sources.

Flexibility – Revising TMDLs

- States have flexibility to revise TMDLs (i.e., TMDLs are not static documents)
  - Statute and EPA regulations do not preclude states from revising TMDLs.
- Such flexibility provides states an opportunity to employ an adaptive management approach, whereby new data and information are used to adjust (as necessary) implementation actions, to make revisions to the TMDL or both.
- An adaptive management approach can be a useful tool, particularly for TMDL implementation that might take many years.

For more information, contact Chris Lewicki (303(d) nutrient team lead), lewicki.chris@epa.gov, (202) 566-1293.